

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

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*In the Matter of*

Spectrum Needs of Emergency Response Providers )  
(FCC 05-80 dated March 29, 2005) )

WT Docket 05-157

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To: The Commission  
VIA the ECFS

**Comments of PacketHop, Inc.**

In the release FCC 05-80 regarding WT Docket 05-157, FCC invited comments on (i) the need for, operation, and administration of a potential nationwide interoperable broadband mobile communications network for emergency response providers, (ii) the extent to which commercial wireless technologies may be used to satisfy the communications needs of emergency response providers, and (iii) future spectrum need including additional allocation of spectrum in the 700 MHz band. This comment from PacketHop, Inc. addresses the first two aspects.

PacketHop, Inc. develops mobile mesh networking software which enables instant wireless group communications for commercial enterprises, government organizations and consumer markets. The company's software enables 802.11 standards-based devices to create extended Wi-Fi hot-zones on the fly – autonomous mobile mesh networks – which can securely operate with or without access points. By making infrastructure completely optional, PacketHop delivers coverage wherever and whenever instant wireless broadband communications are needed. Along with the company's device-agnostic and spectrum-agnostic mobile mesh networking solution that enables rapid and cost-effective deployments, PacketHop offers multimedia applications including real-time multicast video, resource tracking, instant messaging, and whiteboarding.

Spectrum allocation and utilization policies for first responders should lead to interoperable mission-critical systems that derive benefits from maximum leverage of latest technological advances, and are also affordable based on proven COTS technology. First responder community is fortunately well positioned at the crossroads of (i) new developments in broadband networking and information technologies, (ii) emergence of

standards-based commercial broadband radios, and (iii) availability of increasingly powerful and yet affordable mobile computing platforms. For example, recent FCC's allocation of 50 MHz in the 4.9GHz band<sup>1</sup> for the exclusive use of public safety personnel (that enables the utilization of COTS 802.11 radio technology) was very timely and helps in ushering a new era in achieving rapidly deployable, secure, reliable, and interoperable systems to respond to incidents more effectively. The 4.9 GHz allocation decisions also facilitate use of unlicensed bands and Dedicated Short Range Communications (DSRC) in the 5 GHz band, if necessary, for off-loading traffic that is not mission-critical.

### *1. Interoperable broadband wireless communications*

First responders have long communicated by voice using two-way radios over a private wireless network. They now even use cellular phones over a public wireless network. Evolution of their communications facilities closely followed the evolution of technology itself, i.e. circuit-switched narrowband voice channels before the emergence of Internet Protocol (IP)-based packet-switched communications. Experience has shown that the traditional voice facilities, while being inadequate in terms of information dissemination needs, have also been a source of serious interoperability problems as different agencies are not able to communicate on different frequencies they use.

Numerous studies such as the SAFECOM Statement of Requirements<sup>2</sup> confirm what first responders have experienced first-hand: public safety personnel would benefit immensely by having broader multimedia communications capabilities—in terms of coverage, content and mobility with a wireless broadband network at the incident area. Broadband networks can support various usage scenarios such as (i) tracking of locations of other first responders, (ii) viewing live video of the scene by everyone in the vicinity, (iii) real-time sharing of video and high resolution images and other vital information, and (iv) development and execution of action plans in a collaborative and coordinated manner. Provisioning of such services in a standards-based IP-compatible environment assures interoperability, as is evidenced in the Internet revolution around the world. Also, with powerful broadband incident communications applications, need for voice communications can be dramatically reduced—ensuring that critical voice traffic has the best chance of getting through.

The FCC's decision on the 4.9GHz mask issue in November 2004 allowing use of 802.11a (DSRC-A) mask up to 20dBm greatly facilitates the ability to use a large band of unlicensed and licensed spectrum in 5 GHz band (both UNII and DSRC). The capability of radios to dynamically address a large reservoir of spectrum when needed by a user

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<sup>1</sup> FCC *Memorandum Opinion and Order and Third Report and Order (MO&O & Third R&O)*, FCC03-99, WT Docket No. 00-32, May 02, 2003, and FCC *Memorandum Opinion and Order (MO&O)* on Petition for Reconsideration, FCC04-265, November 12, 2004.

<sup>2</sup> "Statement of Requirements for Public Safety Wireless communications & Interoperability" The SAFECOM program, Department of Homeland Security, Version 1.0, March 10, 2004  
[http://www.safecomprogram.gov/SAFECOM/library/technology/1200\\_statementof.htm](http://www.safecomprogram.gov/SAFECOM/library/technology/1200_statementof.htm)

dramatically improves interoperability between public safety agencies. This advantage is fully exploited when first responders establish a mobile mesh enabled incident area network and are able to utilize peer-to-peer (server-less) and survivable applications utilizing licensed spectrum for mission-critical communications and unlicensed spectrum for more routine “mobile office” and internet applications. The increasingly sophisticated security techniques coupled with end-to-end secure application services may even enable mission-critical operation in these bands temporarily. Further, with the advent of radios that perform channel selection across wide spectrum, interoperable use can become automated and more efficient. In such integrated multi-band devices, access to 4.9 GHz band can be restricted only for use by public safety, while allowing public safety access to the unlicensed bands when necessary. The available licensed and unlicensed spectrum in the 4.9 and 5 GHz bands together has the potential to significantly advance public safety broadband communications in a cost-effective and interoperable manner, provided standards-based commercial equipment is utilized.

Technological advances now make these powerful capabilities both achievable and affordable. Multimedia incident communications applications can make use of ordinary laptop/tablet PCs, handheld personal digital assistants (PDAs) and other mobile devices equipped with industry-standard and cost-effective wireless communications. Using peer-to-peer mobile mesh networks, first responders can also instantly establish “on-the-fly” wireless broadband incident area networks with self-contained software running on each first responder’s mobile device.

Over the long term, many other developments can contribute to improved interoperability. Some of them are:

- Software-defined (or cognitive) radios that can manage multi-band multi-mode radios effectively, leading to efficient combined use of both the licensed and unlicensed spectrum by dynamically sharing based on need, availability, cost, and performance.
- New technologies that are in the standards process such as in IEEE, IETF, that contribute to the efficiency of the utilization of the spectrum and interoperability
- The strong trend in migration of voice to packet-switched Voice-over-IP from circuit-switched channels, which significantly increases capacity of voice channels in the already allocated spectrum and will also enhance interoperability

## *2. Use of Commercial wireless technologies*

Efficient and cost-effective use of spectrum is equally important as allocation of new spectrum. Use of standards-based commercially available technology makes the products affordable and hence maximizes the number of first responders that can benefit from the services using the spectrum. The ability to utilize commercial off-the-shelf (COTS) equipment and industry-standard wireless protocols allows broadband communications to take full advantage of the IEEE 802.11b/g/a Wi-Fi capabilities now (built into many laptop/tablet PCs and PDAs) and 4.9GHz later as hardware becomes available.

In addition, unlicensed spectrum at 5 GHz can be made immediately available to public safety in the event of a truly catastrophic event generating a significant increase in traffic. Virtually every manufacturer interested in serving public safety is also interested in providing radios that will provide service from 4.9 GHz to 5.9 GHz. Some of it is evident in the level of interest in WLANs for Japan in 4.9-5.0 GHz band and in the IEEE specification of 802.11j for this band.

Use of standards-based commercial technologies will also allow first responders and public safety personnel in general to reap the benefits of changing technical capabilities and new standards. For example, various Working Groups and Task groups of IEEE 802 Local Area Network (LAN) and Metropolitan Area Network (MAN) Committee are working on new standards such as 802.11n (High throughput), 802.11e (Quality of service), 802.11r (Fast roaming), 802.11s (Extended service set mesh), 802.16-2004 (Broadband Wireless Access, also known as WiMax) and 16e (802.16 enhancements to support mobility), and many others. In addition, a large number of working groups within the Internet Engineering Task Force (IETF) have been actively bringing out new developments related to Internet and its use. Timely utilization of these developing technologies through commercially available standards-based equipment will greatly enhance the ability of public safety community to respond to events across multiple agencies in an interoperable manner.

### *3. Interoperable information infrastructure*

While the use of standards-based radios in a common band is a first step towards interoperability, it is not sufficient to assure interoperable exchange of broadband multimedia information. For the first responders to be able to exchange information, they need to have common infrastructure built on top of the physical radio channels. They will need common channel access mechanisms, data distribution methodology, and ability to view data from different types of sources, such as images and video. For example, use of IEEE 802.11 medium access standards created the interoperability between access points and client adapters of different certified vendors. Similarly, using IP-based environment for all networking and applications was the key in solving networking level interoperability and supporting different IP-compatible applications in packet-switched networks globally. Examples of areas that need interoperability solutions are compatibility of different video codecs, exchange of management information, and security. All the stakeholders involved in public safety and first responder communications need to work together to adopt standards where they are already available such as from IEEE and IETF or develop them where they are not available.

### *4. Concluding remarks*

The allocation of spectrum in the 4.9GHz band and the subsequent decision on mask requirements enable the launch of a significant beginning for public safety incident area communications and paves the way for broadband multimedia communications with multi-agency interoperability. It also enables emergence of secure, survivable and

affordable systems for the use of first responders, with extensible and future-proof features that fully leverage industry-standard COTS equipment.

Respectfully submitted,  
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